ber of close correspondences with the oreodonts and especially in those particulars in which that group differs from other artiodactyl families. On the other hand, there are significant deviations from the oreodonts, which are to be found more particularly in the structures correlated with the curious change in foot structure. It seems on the whole highly probable that the two families are not distantly related, especially if the somewhat intermediate character of *Protoreodon* be considered.

The conclusion to which the available evidence leads is, then, that *Agriochœrus* is the last term in a succession of species which form a curiously specialized offshoot of the *Oreodontidæ*, its divergences from that family being principally the results of a change in the functions and uses of the feet. The separation of the two series was probably already established in the Uinta Eocene, for, in spite of its somewhat intermediate character, *Protoreodon* can be a forerunner only of the oreodonts. The Bridger beds may be expected to yield the common ancestor of the two series, and this animal will probably turn out to be a pentadactyl form, with buno-selenodont dentition and quinquetuberculate upper molars, the unpaired lobe in the anterior half of the crown. As I have elsewhere suggested, this hypothetical form may have been already found in the imperfectly known *Helohyus*.

The likeness of the *Agriochœrus* molars to those of *Hyopotamus* has often been noticed and the inference drawn that these two genera were in some manner more or less closely related. Mr. Hatcher writes me that he has lately found feet of *Hyopotamus* which suggest the same affinities. Until this material has been carefully studied, it will be the part of prudence not to prejudge the question.

Three New Methods for the Detection of Forgery.

By Dr. Persifor Frazer.

(*Read before the American Philosophical Society, May 18, 1894.*)

I wish to put on record three new methods which I have applied successfully for the purpose of detecting frauds in written documents.

The first enables one to determine with comparative ease which of two crossing ink lines was made first, and consists in observing the crossing by a lens of low power (four or five diameters) at a very oblique angle. If a light ink line be made over a darker one the appearance to the eye when viewing the crossing perpendicularly to the plane of the paper will be that the darker line is superposed. The reason of this is that ink lines are quite transparent and the darker line is seen through the lighter one and seems to make one continuous line with its two limbs

across the intersection. When the paper is inclined, however, but few of the rays of light which reach the eye by reflexion from the intersection traverse and lose rays by absorption from both ink films; but the greater number penetrate only the upper ink and do not suffer absorption by the lower.

The second is a method of judging whether or not two lines have been made with the same ink and consists in passing over each in succession prisms of red, yellow or blue glass (or two of these), and noting the number of millimeters through which it is necessary to move each prism from the position where its thin edge is in contact with the mark to be judged to that where the color is extinguished and the line is black. The prism is pushed horizontally over the ink mark continually adding to the thickness of the colored glass over the latter. When the line appears quite black the distance in mm. over which the prism has been pushed is read off and compared with the number of mm. which the other line requires to attain the same result. If the inks have the same colors these results must agree.

Third method. In 1886 I read before the Society a paper on the use of composite photography for the purpose of establishing the type of an individual's writing and especially the signature. Since then the mechanical difficulties in the way have been greatly lessened and the method has given most valuable results in cases before various courts. But there are many occasions where it cannot be employed for one reason or another, and in such cases I have devised a system of measurement and tabulation which accomplishes by figures what composite photography established automatically by form. The older method may be called the graphic average of the handwriting and the later the numerical average. The advantage of the former is that it takes into account at once *all* the elements of character, while the latter can deal only with comparatively few, but in spite of this the results attained have been very interesting.

By the system here alluded to a given number of heights, breadths and angles of letters, and spaces between them and between words, are selected and measured in a large number of undisputed signatures. The same elements are then measured in the signature in dispute. The averages of all the elements in the genuine series is then compared with the latter, and their agreement or disagreement will generally lead to a correct judgment as to the genuineness of the disputed signature.

This method has given successful results in a direction which extends the original idea to a study of "guided hands," and it has been possible to extract from the columns of measurements, proofs of the existence of characteristics of each of the separate handwritings.